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Injecting risk behaviours among people who inject drugs: A global multi-stage systematic review and meta-analysis

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Abstract

Background: Injecting risk behaviour, such as receptive sharing of injecting equipment and/or re-using one's equipment, is associated with bloodborne virus transmission and infections in people who inject drugs (PWID). We aimed to estimate prevalence and correlates of injecting risk behaviours among PWID.

Methods: We conducted a systematic review and meta-analyses to estimate country, regional, and global prevalences of injecting risk behaviours (including sharing or re-using needle/syringe and sharing other injecting equipment). Using meta-regression analyses, we determined associations between study- and country-level characteristics and receptive needle/syringe sharing.

Results: From 61,077 identified papers and reports and 61 studies from expert consutation, evidence on injecting risk behaviours was available for 464 studies from 88 countries. Globally, it is estimated that 17.9% (95%CI: 16.2-19.6%) of PWID engaged in receptive needle/syringe sharing at last injection, 23.9% (95%CI: 21.2-26.5%) in the past month, and 32.8% (95%CI: 28.6-37.0%) in the past 6-12 months. Receptive sharing of other injecting equipment was common. Higher prevalence of receptive needle/syringe sharing in the previous month was associated with samples of PWID with a lower proportion of females, shorter average injecting duration, a higher proportion with ≥daily injecting, and older studies. Countries with lower development index, higher gender inequality and lower NSP coverage had higher proportions reporting receptive needle/syringe sharing.

Conclusions: High levels of injecting risk behaviours were observed among PWID globally, although estimates were only available for half of the countries with evidence of injecting drug use. There is a need for better capture of injecting risk behaviours in these countries to inform implementation of harm reduction services and evaluate potential impacts of interventions to reduce risk.

Introduction

A 2017 systematic review found evidence of injecting drug use (IDU) in 179 countries containing 99% of the world population, with between 10.2-23.7 million people who inject drugs (PWID) globally[1]. There are a range of injecting practices which may carry varying levels of risk to an individual and be amenable to differing interventions to reduce such risk. These include (but are not limited to) sharing needles/syringes; reusing one's own needle/syringe for multiple injections; and sharing or reusing other injecting equipment, such as filters and spoons for dissolving drugs for injection[2]. Sharing injecting equipment causes substantial disease burden, primarily due to transmission of blood-borne viruses (BBV), including human immunodeficiency virus (HIV), hepatitis C virus (HCV), and hepatitis B virus (HBV). Globally, estimates suggest that approximately one in six people who have recently injected drugs are living with HIV[1], two in five are currently infected with HCV[3], and one in 10 have active HBV[1]. Through unsafe injecting techniques, particularly using non-sterile equipment, PWID are also at increased risk of exposure to bacterial infections[4].

Sharing injecting equipment and other injecting risk behaviours can arise through no or limited access to sterile needles, syringes and injecting equipment[5]. Poor injecting technique and injecting risk behaviour can also develop in response to marginalisation, which can be created by criminal sanctions of drug use[6]. Marginalisation and stigma can act to reduce awareness and/or use of existing harm reduction services, which may reduce opportunities for accessing sterile injecting equipment, and advice on safer injection techniques[7,8]. Many PWID are also exposed to

risk environments (e.g. police confrontations, incarceration, unstable housing)[1,9] that are associated with increased likelihood of unsafe injecting behaviours (e.g. public injecting, needle/syringe sharing, not using swabs to clean the injection site), thereby placing them at greater risk of drug-related harm[10-13].

A range of factors may be associated with the likelihood of injecting risk behaviours. These may include individual characteristics such as gender, age, duration of injecting career and the types of drugs being injected, which may affect frequency of injecting[14-17]. They may also include exposure to riskier environments such as living in unstable housing. As well as individual factors, structural and community-level factors may be contributing to variation. These might include drug market characteristics and drug policy that govern the availability of different drug types; as well as governmental and social responses to injecting drug use and people who inject drugs, including availability of interventions known to reduce injecting risk (needle and syringe programmes, opoid agonist treatment (OAT))[18,19]. Depending on the country and region, the number of PWID and coverage of program interventions targeting harms associated with injecting risk behaviours can differ quite substantially[1,20]. Broader societal characteristics such as income inequality, gender equality and country-level development may affect attitudes towards and marginalisation of PWID. However, the relationship between these country-level factors and injecting risk behaviours has, to our knowledge, not previously been explored since most studies are conducted in a single country, precluding study of variation between countries.

To our knowledge, there has not previously been a global systematic review of the extent of injecting risk behaviours among PWID at a country, regional, and global level. Such information is critical to inform global and national policies to prevent bloodborne viruses and other injecting-

related harms, and ensure such policies are targeted at those at greater risk, and to both highlight and respond to more systemic barriers to harm reduction. As such, we aimed to:

1. Estimate the proportion of PWID engaging in injecting risk behaviours at country, regional, and global levels;
2. Explore variation in the estimated prevalence of receptive needle/syringe sharing with estimated country-level NSP and OAT coverage; and
3. Explore associations between injecting risk behaviours and study-level factors (e.g., sociodemographic, drug use and other behavioural characteristics of PWID samples) and country-level factors (e.g., availability of NSP and OAT, as well as broader societal characteristics).

Methods

Search strategy

We conducted a global systematic review in accordance with GATHER and PRISMA guidelines (**Appendix 1**). This review is based on data from a systematic literature search focusing on the prevalence of IDU and characteristics of PWID, details of which are described elsewhere[1]. Briefly, we conducted systematic searches in July 2016 through peer-reviewed databases (Medline, Embase, and PsycINFO) for papers and reports published from 2008 onwards. Search terms included exploded MeSH terms and keywords for IDU and epidemiology (**Appendix 2**). We did not limit our search by language. We also searched the key websites and grey literature (see **Appendix 3**). The peer-reviewed database searches were updated to July 2018. Data requests were also disseminated to international experts and agencies. The protocols are registered on PROSPERO (CRD42016052858 and CRD42016052853).

Screening and extraction

Title/abstract and full-text screening was conducted by two authors, and disputes were resolved by a third author. Included studies were collated into an EndNote database and extracted into a custom Microsoft Access Database by one team-member and double-checked by a second, senior team-member. We excluded studies that did not include data on PWID specifically, were randomised-controlled trials, investigated a sub-population (e.g. people living with HIV), or had a sample size of <40 PWID.

We extracted injecting risk variables for five timeframes: last injection, past month, past 6 months, past 12 months, and lifetime. The pre-specified injecting risk variables extracted are listed in **Table 1.**

Table 1 about here

For each eligible study, we extracted data on pre-defined socio-demographic characteristics, drug use and other behavioural data. Study-level variables included year of data collection, sample size, method of recruitment (e.g. NSP centres, peer referrals, and surveys), sex, age (median, mean, and/or range), length of time injecting (in years), frequency of injecting (extracted by the categories defined in the original study and then grouped as daily or more and less than daily injecting; for more detail see[21]), incarceration history (past 12 months and lifetime), homelessness or unstable housing (within the past year), current engagement in opioid agonist therapy (OAT), and opioids as main drug injected.

Country-level variables included study region (Eastern Europe, Western Europe, Australasia, Pacific Island States and Territories, South Asia, East and South East Asia, Central Asia, Middle East and North Africa, Sub-Saharan Africa, North America, Caribbean, and Latin America; see **Appendix** for a list of countries in each region), Human Development Index score, Gender Inequality Index score, income inequality as measured by the Gini coefficient[22].

Associations between injecting risk behaviour and OAT and NSP coverage, operationalised as the number of needles/syringes distributed per 100 PWID[5] and the number of people receiving OAT per 100 PWID[5] in that country per year, were also included. These data were derived from an

earlier multistage systematic review[5], also conducted in accordance with GATHER and PRISMA guidelines. That review was also registered on PROSPERO (CRD42017056558); full details of the methods used are described elsewhere[5].

Data analysis

Estimates for each injecting risk behaviour were pooled by country using random-effects meta-analysis in Stata 15.0 (StataCorp, College Station, TX, USA). For the purposes of capturing the most recent evidence for each variable, the most recent 5 years of estimates were used for each country (e.g. we included estimates from 2011-2015 for a given country if the most recent estimate for receptive needle/syringe sharing in the past month was from 2015). Country-level estimates were then pooled using the same method to generate a regional estimate, and then an overall global estimate.

Using estimates of the number of needle-syringes distributed per PWID per year[5] and the number of people receiving OAT per 100 PWID per year[5], we generated scatterplots to examine potential associations between country-level NSP coverage and OAT coverage, and the estimated country-level pooled proportion of PWID reporting receptive needle/syringe sharing in the past 6-12 months.

Where we had data available, we examined the association between the prevalence of injecting risk behaviours and study- and country-level characteristics. Using meta-regression analysis, we undertook bivariate analyses of associations of injecting risk behaviour with study- and country-level variables. We excluded variables from this analysis that were available for fewer than 25% of the studies identified with an estimate of the injecting risk behaviour.

Results

The search found a total of 61,077 reports/papers and 61 reports provided via expert consultation, of which 464 eligible papers/reports contained data on injecting risk behaviours among PWID (for study flowchart, see **Appendix 4**). The full list of identified eligible studies is reported in **Appendix 5.**

Overall, studies of injecting risk behaviours among PWID were identified for 88 out of 179 countries with evidence of injecting drug use (49%; **Table 2**). The most commonly studied behaviours were receptive needle/syringe sharing, receptive injecting equipment sharing, and needle/syringe re-use (**Appendix 6**). The most commonly reported timeframes were at last injection and past month, with 6 months and 12 months being combined for the analyses below. Most studies were conducted in single cities (54%) or other sub-national (37%) settings with recruitment occurring between 1996 and 2016 (see **Appendix 6**).

Estimates of receptive needle/syringe sharing were identified for the largest number of countries (n=36 countries for last injection, n=42 for past month, and n=31 for past 6-12 months; **Table 2**). Data on re-use of one's own needle/syringe, and on receptive sharing of other injecting equipment, were scarcer (**Table 2**) and typically reported for the past month.

To summarise country-level data, we present pooled estimates of the proportion of PWID reporting receptive needle/syringe sharing, receptive sharing of other equipment, and needle/syringe re-use as these were the most commonly reported by studies. Pooled estimates

using the most recent five years of data identified for each country are reported below (pooled estimates using all available data can be found in **Appendix 7**; results were similar). Estimates of the proportion of PWID who reported engaging in other injecting risk behaviours, including distributive needle/syringe sharing, being injected by someone else, and not cleaning injecting site before injecting (e.g. by swabbing), were less commonly located. Studies reporting these can be found in **Appendix 8 and 9**.

Table 2 about here

Receptive needle-syringe sharing

Data on receptive needle/syringe sharing was the most widely collected injecting behaviour among PWID (**Table 2**). Eastern Europe had the largest number of countries (and greatest proportion of countries) with data on this behaviour. Globally, it is estimated that 17.9% (95% confidence interval [95%CI]: 16.2-19.6%) of PWID engaged in receptive needle/syringe sharing at last injection, 23.9% (95%CI: 21.2-26.5%) in the past month, and 32.8% (95%CI: 28.6-37.0%) in the past 6-12 months (**Table 3**). Regional estimates are displayed for past month receptive needle/syringe sharing in **Figure 1a** and country estimates in **Figure 1b** (see **Appendix 10** for maps of regional and country estimates for past 6-12 months receptive needle/syringe sharing).

Figure 1 about here

There was variation between countries and regions in levels of receptive needle/syringe sharing. Middle East and North Africa (33.5%, 95%CI: 5.4-61.7%, 3/21 countries with evidence of IDU), South Asia (32.1%, 95%CI: 26.0-38.3%, 5/9 countries with evidence of IDU) and Eastern Europe (31.1%, 95%CI: 24.5-37.7%, 13/17 countries with evidence of IDU) had the highest pooled

estimates of receptive needle/syringe sharing in the last month. Within Eastern Europe, estimates ranged greatly from 8.5% (95%CI: 8.0-9.0%) in Ukraine to 80.6% (95%CI: 71.3-90.0%) in Azerbaijan. The lowest pooled estimates of receptive needle/syringe sharing in the last month were for Western Europe and Australasia (Australia) at 9.8% (95%CI: 7.1-12.5, 6/33 countries with evidence of IDU) and 10.6% (95%CI: 7.5-13.6), respectively.

Receptive sharing of other injecting equipment

Seventeen countries had studies reporting on receptive sharing of other injecting equipment (**Table 2**) across any reporting period, with country-level estimates shown in **Table 3**. Receptive sharing of other injecting equipment was common at last injection (20.1%, 95%CI: 12.2-28.0%), within the past month (30.5%, 95%CI: 21.2-39.8%), and past 6-12 months (36.2%, 95%CI: 29.6-42.9%) (**Table 3**). Limited data coverage across countries limited capacity to make firm conclusions about any geographical differences.

Re-using one's own needle-syringe

Out of the 36 countries where data of reusing one's own needles and syringes were available, the majority (17 countries) assessed this behaviour within the past month. Reusing one's own needle/syringe was reported by 49.1% (95%CI: 40.1-58.1%) of PWID within the past month. Data were much sparser for other timeframes (**Table 2**). Limited data coverage across countries limited capacity to make firm conclusions about any geographical differences.

Table 3 about here

Examining variation in estimated prevalence of receptive needle/syringe sharing with estimated country-level NSP and OAT coverage

There were 25 countries with available data for NSP coverage and past 6-12 months receptive needle/syringe sharing (**Figure 2a**; 81% of countries with estimates of past 6-12 months receptive needle/syringe sharing and 14% of countries with evidence of any IDU). Notably, all countries (n=5) with a pooled estimate of >50% prevalence of receptive needle/syringe sharing in the past 6-12 months also had low or no NSP coverage (<50 needles distributed per PWID per year). Countries with lower injecting risk estimates appeared to have higher estimates of NSP coverage. This was less distinct when examining the relationship between NSP coverage and receptive needle and syringe sharing within the past month (see **Appendix 11**).

Figure 2b illustrates the countries with available OAT coverage data and receptive needle/syringe sharing in the past 6-12 months (n=27 countries; 87% of countries with estimates of past 6-12 months receptive needle/syringe sharing and 14% of countries with evidence of injecting drug use). Past month data are shown in **Appendix 12**.

Figure 2 about here

Associations of injecting risk behaviours with study- and country-level variables

Given available data, we only undertook meta-regressions examining associations between study- and country-level variables with receptive needle/syringe sharing in the past month. Meta-regressions using study-level variables of incarceration history and current engagement in OAT were not conducted as <25% of the studies with an estimate of receptive needle/syringe sharing in the past month also reported on these variables. A higher proportion of PWID reporting

receptive needle/syringe sharing in the past month was associated with several factors (**Table 4**). At the study-level, these include a shorter average injecting duration of the sample, a higher proportion of PWID reporting injecting daily or more, a lower proportion of PWID who are female, and older studies. Upon examining country-level factors, studies conducted in Western European, Australasian, and East and South East Asian samples had lower proportions of PWID reporting past-month receptive needle/syringe sharing compared to Eastern European samples. Furthermore, countries with lower development and higher gender inequality, as indicated by lower Human Development Index (HDI) and higher Gender Inequality Index (GII) scores, had higher proportions of PWID samples reporting receptive needle/syringe sharing. Higher country-level NSP coverage was associated with a lower reported engagement with receptive needle/syringe sharing in the past month (**Table 4**). No association was found between country-level OAT coverage and proportion of PWID reporting receptive needle/syringe sharing in the past month (**Table 4**).

Table 4 about here

Discussion

In this global systematic review, it is estimated that 23.9% (95%CI: 21.2-26.5%) of PWID had engaged in receptive needle/syringe sharing in the past month. Similarly, high proportions of PWID reported sharing other injecting equipment (30.5%, 95%CI: 21.2-39.8%) and resuse of one's own needle/syringe (49.1%, 95%CI: 40.1-58.1%) in the past month. A higher proportion of PWID reporting receptive needle/syringe sharing in the previous month was associated with samples of PWID with a higher proportion that were female, a shorter average injecting duration, a higher proportion with >daily injecting, and older studies. Countries with lower development index and higher gender inequality had higher proportions of receptive needle/syringe sharing. Ecological associations between lower NSP coverage and increased injecting risk behaviours were observed, and all countries reporting >50% of PWID shared needles/syringes recently had no NSP programmes at all.

Data on injecting risk behaviours were only available for 49% of countries with evidence of injecting. Our review of sociodemographic characteristics of PWID from which these data are drawn[1] identified many more studies than included here, highlighting the lack of systematic capture and reporting on injecting risk behaviours. Given targets for global HIV and HCV elimination[23-25] it is important that these behaviours are closely monitored into the future to better understand harm reduction service needs among PWID and opportunities for educate regarding injecting practices. Variation in the types of injecting risk behaviours assessed and in how those injecting risk behaviours were defined, coupled with a lack of detail regarding the latter, meant that many estimates could not be included in pooled analyses. These findings

reinforce the need for standardisation of definitions of injecting risk behaviours across studies, to increase the consistency and relaibility of estimates of injecting risk behaviours across settings.

Where injecting risk behaviour has been assessed, it is clear that a large percentage of PWID do engage in risk, which can lead to the perseverance of ongoing BBV epidemics that cause huge disease burden[26]. The highest pooled estimates of receptive needle/syringe sharing in the last month were found in the Middle East and North Africa, South Asia, and Eastern Europe, with approximately one third of PWID reporting this injecting risk behaviour in the past month. Western Europe and Australasia (Australia) had the lowest pooled prevalence, with approximately one in 10 PWID estimated to receptively share needles/syringes in the past month. Notably, those countries with no or lower NSP coverage typically had higher pooled estimates of receptive needle/syringe sharing, and NSP coverage was inversely associated with the proportion of PWID reporting past month receptive needle-syringe sharing.

This review also highlighted that PWID living in countries with lower human development had higher levels of injecting risk, suggesting that indicators of a country's outcomes related to life expectancy, education and gross national income[27] are related to risk. The higher proportion of past month receptive needle and syringe sharing could be a reflection of lower scoring countries having reduced resources to spend on educational and harm reduction interventions including NSP provision and OAT.

The finding that greater gender inequality, measured through the disparity between men and women in the domains of healthcare, employment, education and government, was related to injecting risk is important. Studies of gender differences among PWID found that women are

more dependent on their sexual partners and experience greater injecting-related stigma, leading to increase receptive needle and syringe sharing and lower engagement with harm reduction services when compared to men[28-31]. This may also lead to barriers to accessing harm reduction services and sterile injecting equipment[29,30].

These findings reinforce that widespread availability and provision of clean needles, syringes and other injecting equipment for PWID is crucial to reduce re-use of needles and syringes. Educating PWID about the risks of unsafe injecting and ways to make injecting less risky is important and there are effective interventions to address this, which are also inexpensive to deliver[32-34]. There is good evidence that OAT reduces the extent of injecting risk behaviour among people who are opioid dependent[35,36]. Finally, increasing the capacity of PWID to inject in a safe environment without fear of detection, harassment or police interactions is important; in areas where there is considerable public (and perhaps risky) injection, supervised injecting sites provide a clean, safe and secure environment for people to inject[37,38].

It is also important to consider sociodemographic characteristics of those with elevated risk of injecting risk behaviour to inform targeted intervention. Meta-regression analyses of age did not show an association with the proportion of PWID reporting past-month receptive needle/syringe sharing. By contrast, shorter duration of injecting was associated with a greater proportion of PWID reporting past-month receptive needle/syringe sharing. Other studies also have shown that HIV and HCV incidence are higher in the first years of injecting[39,40]. Intervening early to ensure recent PWID are linked to harm reduction services and educated regarding safer injecting practices is critical to ongoing prevention efforts.

Limitations

Our review was subject to limitations (discussed in detail previously[1]). First, despite our relatively wide scope of online searches and requests for information from people across many countries, grey literature reports can be difficult to access. Undoubtedly, we have missed some of these studies. To address this as much as possible, we liaised directly with international agencies to facilitate contact with people in-country and obtain reports that were not available online.

Second, many documents were reviewed by a small research team in a short period of time, so we may have missed some information in this process. However, internal checks were conducted and a process of double and triple checking was used. Further, the estimates produced were circulated to all potential authors for input, allowing for identification of missing or incorrect data.

The results presented were limited by the availability of injecting risk behaviour data. The lack of studies resulted in some regional estimates being based on one or two studies, especially for re-using one's own needles/syringes and receptive sharing of other equipment. There were instances where there were very wide confidence intervals around country and regional estimates, and in some cases inconsistencies in estimates across timeframes. For example, a single study in China had very low 6-12 month prevalence of receptive injecting risk, compared to higher estimated past month injecting risk derived from multiple studies. These kinds of inconsistencies must be taken into account when considering the robustness of the data.

The main method to collect information on injecting risk among the studies was to administer a survey or questionnaire. There is some evidence that quantitative self-report assessment of

injecting risk behaviour may underestimate the level of risk in the population – through a combination of response biases relating both to memory and willingness to report negative behaviours, though responses are fairly reliable and valid[41]. Many of the studies also recruited participants through NSPs or advertisements; the PWID captured through these studies may represent those who are also engaged in harm reduction or treatment services. This could mean that the pooled estimates presented in this study may be an underestimate of the actual prevalence of injecting risk behaviours among broader populations of PWID who are not in contact with harm reduction or treatment services.

Conclusion

Existing studies of injecting risk behaviour among PWID have often revealed high levels of a range of injecting risk behaviour, likely contributing to the high burden of infections and BBVs among this population. This calls for public health interventions to support safe injecting behaviours in this population. Despite the importance of this risk for the health of PWID, assessments are inconsistent in their definitions and timeframes, and for many countries we did not locate any studies documenting how common these behaviours might be. Such data are crucial to inform service planning, consider the extent of need for key harm reduction interventions, and evaluate potential impacts of interventions to reduce risk. These data are critical to inform future planning and to inform policy to improve coverage to harm reduction interventions globally.

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Authors' Contribution

Screening and review was undertaken by LLT, SC, LD, AP, SL, JL and JG. LTT, SC, JL, JG, JS and AT played additional roles overseeing and conducting data extraction and verification. The approach to selection and pooling of all data was developed and agreed upon by LD, MH, SL, AP, JG, JL. Data analysis and estimate generation were undertaken by LTT and SC. LTT and LD drafted the first iteration of manuscript. All authors made substantial concepts to critical review, editing and revision of the manuscript. All authors approved the final version of the manuscript.

Declaration of interests

In the past three years, LD has received investigator-initiated untied educational grants for studies of opioid medications in Australia from Indivior and Seqirus. SL has received investigator-initiated untied educational grants from Indivior. AP and SM have received investigator-initiated untied educational grants from Seqirus. JG is a consultant/advisor and has received research

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Table 1: Summary of injecting risk behaviours extracted

Behaviour	Definition
Receptive needle and syringe sharing	Using a needle or syringe after someone else has already used it
Distributive needle and syringe sharing	Allowing someone else to use a needle or syringe after you have used it
Unspecified needle and syringe sharing	Type of needle or syringe sharing was not clearly defined
Receptive sharing of other equipment	Using other injecting equipment (e.g., cotton, filter, spoon, tourniquet) after someone else has used it
Distributive sharing of other equipment	Allowing someone else to use other injecting equipment after you have used it
Unspecified sharing of other equipment	Type of other injecting equipment sharing was not clearly defined
Receptive sharing of any equipment	Using any injecting equipment after someone else has already used it
Distributive sharing of any equipment	Allowing someone else to use any injecting equipment after you have used it
Unspecified sharing of any equipment	Type of any injecting equipment sharing was not clearly defined
Re-using any of your own equipment	Using any of your injecting equipment more than once
Re-using your own needles and syringes	Using any of your needles or syringes more than once
Re-using your own other equipment	Using any of injecting equipment, except needle and syringes, more than once
Injected by someone else	Having someone else inject you instead of doing it yourself
No filter used	Not using a filter to remove impurities before injecting
No sterile needle and syringe	A sterile needle or syringe was not used to inject (where it was not clear whether the question referred to use by another person prior, re-use by the same individual or other situation in which a needle/syringe could be considered non-sterile)
No cleaning of injecting site	The site of injection was not cleaned before injecting (e.g., swabbing)
Other	Any other behaviour that did not fit any of the above categories (e.g., backfilling or frontloading)

Table 2: Summary of the amount of regional data on injecting risk behaviour

	No. countries in region	No. countries with evidence of injecting	No. countries with data on receptive sharing of needles			No. countries with data on re-use own needle			No. countries with data on receptive sharing of other equipment		
			at last injection	in the past month	in the past 6-12 months	at last injection	in the past month	in the past 6-12 months	at last injection	in the past month	in the past 6-12 months
Eastern Europe	17	17	7	13	5	1	5	-	1	3	-
Western Europe	33	31	3	6	3	-	2	1	1	3	1
East and Southeast Asia	17	16	6	5	4	2	1	-	-	1	-
South Asia	9	9	5	5	5	3	3	2	1	2	1
Central Asia	5	5	3	-	3	-	-	1	-	-	-
Caribbean	15	6	-	1	-	-	-	-	-	-	-
Latin America	20	19	3	-	2	-	-	-	-	-	1
North America	2	2	-	2	2	-	1	1	-	1	2
Pacific Island states & territories[1]	17	15	-	-	-	-	-	-	-	-	-
Australasia	2	2	-	1	2	-	1	-	-	1	-
Sub-Saharan Africa	47	36	5	6	5	-	3	-	1	-	-
Middle East & North Africa	22	21	4	3	-	-	1	1	1	-	-
Global	**206**	**179**	**36**	**42**	**31**	**6**	**17**	**6**	**5**	**11**	**5**

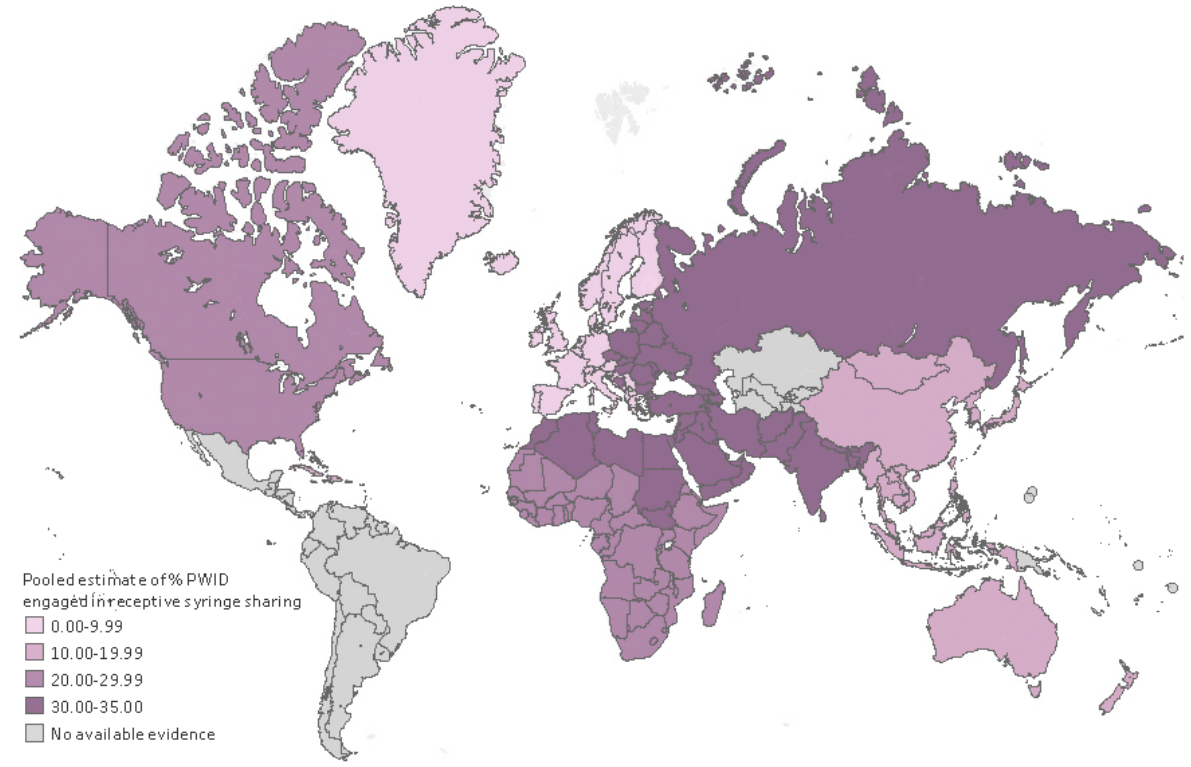
Table 3: Country-level estimates of injecting risk behaviours reported among people who inject drugs (PWID) at last injection, in the past month and in the past 12 months

	Receptive needle/syringe sharing			Re-using own needle and syringe			Sharing other equipment		
	At last injection	In the past month	In the past 6-12 months	At last injection	In the past month	In the past 6-12 months	At last injection	In the past month	In the past 6-12 months
Australasia	--	**10.6 (7.5-13.6)**	**30.4 (27.7-33.2)**	--	**38.1 (30.3-45.8)**	--	--	**49.4 (43.2-55.7)**	--
Australia	--	10.6 (7.5-13.6)	26.4 (22.1-31.2)	--	38.1 (30.3-45.8)	--	--	49.4 (43.2-55.7)	--
New Zealand	--	--	32.9 (29.4-36.4)	--	--	--	--	--	--
Caribbean		**13.4 (8.8-19.3)**	--	--	--	--	--	--	--
Puerto Rico		13.4 (8.8-19.3)	--	--	--	--	--	--	--
Central Asia	**17.8 (11.1-24.4)**	--	**42.0 (16.9-67.1)**	--	--	**51.9 (47.3-56.6)**	--	--	--
Kazakhstan	20.7 (17.2-24.5)	--	54.1 (49.6-58.5)	--	--		--	--	--
Kyrgyzstan	11.7 (10.0-13.4)	--	18.5 (15.2-22.1)	--	--		--	--	--
Tajikistan	24.6 (20.6-28.9)	--	53.6 (48.8-58.4)	--	--	51.9 (47.3-56.6)	--	--	--
East and South East Asia	**25.5 (17.4-33.6)**	**17.0 (11.3-22.7)**	**35.4 (17.5-53.3)**	**4.7 (2.9-6.5)**	**33.0 (24.2-42.8)**	--	--	**22.4 (6.9-37.9)**	--
Cambodia	35.3 (28.1-43.0)	33.5 (26.5-41.2)	--	31.9 (23.7-41.1)	33.0 (24.2-42.8)	--	--	--	--
China	14.4 (13.6-15.3)	29.8 (20.4-39.1)	9.9 (7.6-12.3)	--	--	--	--	22.4 (6.9-37.9)	--
Indonesia	4.1 (3.5-4.8)	10.3 (5.8-14.7)	--	--	--	--	--	--	--
Malaysia	--	47.9 (43.3-52.6)	--	--	--	--	--	--	--
Myanmar	18.9 (14.4-23.3)	--	32.3 (25.1-40.2)	3.6 (2.1-5.0)	--	--	--	--	--
Philippines	56.6 (25.3-88.0)	--	72.2 (55.6-88.8)	--	--	--	--	--	--
Thailand	7.4 (4.2-12.0)	--	--	--	--	--	--	--	--
Viet Nam	--	9.6 (5.8-13.5)	12.3 (0.0-26.3)	--	--	--	--	--	--
Eastern Europe	**10.3 (8.2-12.3)**	**31.1 (24.5-37.7)**	**24.7 (15.0-34.4)**	**29.1 (24.6-33.9)**	**49.6 (38.0-61.2)**	--	**5.5 (3.0-7.9)**	**53.5 (35.5-71.5)**	--
Armenia	21.0 (16.7-25.2)	12.1 (5.2-18.9)	--	--	--	--	--	--	--
Azerbaijan	42.8 (14.1-71.6)	80.6 (71.3-90.0)	--	--	--	--	--	--	--
Belarus	9.7 (5.8-13.6)	12.0 (7.0-17.0)	--	--	45.4 (35.8-54.9)	--	--	--	--
Bosnia & Herzegovina	8.2 (6.5-9.9)	29.5 (2.8-56.1)	18.4 (14.3-22.5)	--	--	--	--	--	--
Bulgaria	--	40.0 (37.8-42.2)	40.0 (36.7-43.4)	--	25.1 (22.2-28.2)	--	--	--	--
Czech Republic	--	--	29.6 (25.5-34.0)	--	--	--	--	--	--
Estonia	--	23.5 (19.1-28.3)	14.4 (10.6-18.9)	--	--	--	--	--	--
Georgia	5.9 (3.3-8.4)	19.1 (13.9-24.4)	--	--	--	--	5.5 (3.0-7.9)	48.0 (35.3-60.7)	--
Latvia	--	35.2 (29.7-41.1)	--	--	--	--	--	--	--
Lithuania	--	67.2 (61.6-72.5)	--	--	--	--	--	--	--
Moldova (Republic of)	--	10.1 (2.6-17.7)	--	--	--	--	--	--	--
Romania	17.6 (15.0-20.2)	31.6 (28.8-34.4)	--	29.1 (24.6-33.9)	74.7 (71.6-77.8)	--	--	--	--
Russian Federation	--	24.9 (17.2-32.6)	25.2 (18.6-32.6)	--	74.0 (69.8-78.2)	--	--	84.7 (82.7-86.5)	--
Ukraine	3.3 (2.6-4.1)	8.5 (8.0-9.0)		--	35.0 (34.0-36.0)	--	--	48.1 (47.1-49.1)	--
Latin America	**25.0 (14.4-35.5)**	--	**52.7 (29.6-75.7)**	--	--	--	--	--	**54.2 (50.1-58.3)**
Colombia	14.7 (11.7-17.6)	--	42.0 (37.9-46.1)	--	--	--	--	--	54.2 (50.1-58.3)
Mexico	28.7 (25.6-32.0)	--	71.4 (68.0-74.7)	--	--	--	--	--	
Nicaragua	46.3 (30.7-62.6)	--	--	--	--	--	--	--	--
Middle East and North Africa	**18.7 (12.2-25.2)**	**33.5 (5.4-61.7)**	--	--	**81.1 (77.8-84.4)**	**54.7 (47.8-61.5)**	**31.3 (24.8-38.3)**	--	--

	Receptive needle/syringe sharing			Re-using own needle and syringe			Sharing other equipment		
	At last injection	In the past month	In the past 6-12 months	At last injection	In the past month	In the past 6-12 months	At last injection	In the past month	In the past 6-12 months
Israel	11.1 (7.1-16.3)	19.1 (13.9-25.3)	--	--	--	--	--	--	--
Morocco	23.8 (12.0-35.5)		--	--	81.1 (77.8-84.4)	54.7 (47.8-61.5)	--	--	--
Occupied Palestinian Territory	10.9 (6.9-16.2)	19.1 (13.9-25.3)	--	--	--	--	31.3 (24.8-38.3)	--	--
Syrian Arab Republic	19.5 (15.7-23.8)	62.5 (56.6-68.0)	--	--	--	--	--	--	--
North America	--	**21.5 (3.8-39.3)**	**27.7 (23.7-31.7)**	--	**37.1 (33.4-40.7)**	**20.8 (14.5-28.4)**		**17.3 (13.2-22.1)**	**41.3 (34.5-48.1)**
Canada	--	20.4 (17.6-23.3)	15.8 (13.7-17.9)	--		20.8 (14.5-28.4)			38.0 (34.8-41.2)
United States of America	--	22.7 (0.0-46.1)	34.4 (30.0-38.7)	--	37.1 (33.4-40.7)			17.3 (13.2-22.1)	57.0 (56.1-57.9)
South Asia	**20.1 (17.2-22.9)**	**32.1 (26.0-38.3)**	**26.0 (14.6-37.5)**	**22.6 (13.2-32.0)**	**55.6 (28.7-82.6)**	**38.3 (29.7-46.9)**	**33.8 (12.9-54.7)**	**10.4 (4.2-16.6)**	**12.2 (8.7-16.4)**
Afghanistan	--	--	6.9 (1.9-11.8)	--	--	--	--	--	--
Bangladesh	50.3 (23.5-77.0)	54.8 (43.5-66.1)	--	--	--	--	--	--	--
India	13.5 (11.4-15.6)	22.0 (13.4-30.6)	33.7 (32.1-35.3)	24.5 (13.9-35.1)		36.9 (28.2-45.6)	33.8 (12.9-54.7)	--	--
Iran (Islamic Republic of)	--	20.4 (1.1-39.7)	47.4 (44.8-50.1)	--	43.4 (39.0-47.9)	59.8 (55.4-64.1)	--	54.1 (40.8-66.9)	--
Maldives	23.4 (18.5-28.4)	--	--	--	--	--	--	--	--
Nepal	0.9 (0.2-1.6)	16.9 (6.1-27.6)	51.0 (45.2-56.8)	1.0 (0.3-1.7)	4.6 (3.1-6.1)	--	--	3.5 (0.3-6.6)	12.2 (8.7-16.4)
Pakistan	23.7 (17.6-29.8)	42.1 (36.8-47.4)	17.2 (16.0-18.4)	--	74.7 (63.8-85.6)	--	--	--	--
Sri Lanka	--	--	--	57.5 (50.6-64.3)	--	--	--	--	--
Sub-Saharan Africa	**34.9 (20.4-49.4)**	**23.0 (16.1-30.0)**	**40.5 (27.7-53.4)**		**49.5 (31.7-67.3)**	--	**34.1 (32.2-35.9)**	--	--
Benin	--	25.0 (17.5-33.7)	--	--	--	--	--	--	--
Côte d'Ivoire	--	1.8 (0.0-9.4)	--	--	--	--	--	--	--
Kenya	6.4 (5.3-7.5)	44.1 (39.3-48.8)	--	--	56.0 (47.7-64.1)	--	34.1 (32.2-35.9)	--	--
Madagascar	--	--	19.3 (8.1-30.4)	--	--	--	--	--	--
Mauritius	10.8 (8.2-13.9)	--	42.4 (38.0-46.9)	--	--	--	--	--	--
Nigeria	--	17.7 (8.4-27.0)	--	--	33.1 (27.1-39.4)	--	--	--	--
Senegal	--	--	--	--	60.0 (51.4-68.2)	--	--	--	--
Seychelles	21.7 (16.6-27.6)	30.9 (26.1-36.1)	--	--	--	--	--	--	--
Sierra Leone	74.6 (68.2-80.4)	--	60.0 (53.8-66.0)	--	--	--	--	--	--
South Africa	48.9 (44.3-53.5)	--	46.2 (35.9-56.5)	--	--	--	--	--	--
Tanzania (United Republic of)	--	31.2 (28.2-34.1)	67.1 (55.6-77.3)	--	--	--	--	--	--
Western Europe	**11.7 (4.5-18.9)**	**9.8 (7.1-12.5)**	**43.3 (33.1-53.5)**	--	**45.4 (42.4-48.5)**	**65.1 (60.5-69.5)**	**14.6 (0.0-29.6)**	**24.2 (16.2-32.2)**	**28.0 (25.3-30.7)**
Albania	25.5 (19.6-32.1)	39.5 (32.7-46.6)	--	--	--	--	--	--	--
Belgium	--	20.8 (17.1-24.5)	--	--	45.2 (38.5-52.1)	--	--	18.7 (13.8-24.4)	--
Croatia	3.9 (0.0-8.3)	14.1 (0.0-28.5)	--	--	--	--	14.6 (0.0-29.6)	--	--
Germany	--	--	--	--	45.5 (42.0-49.1)	--	--	--	--
Montenegro	--	26.0 (20.9-31.6)	--	--	--	--	--	--	--
Serbia	16.8 (13.5-20.0)	5.2 (3.3-7.1)	--	--	--	--	--	3.7 (2.2-5.3)	--
Spain	--	--	45.1 (43.3-46.8)	--	--	65.1 (60.5-69.5)	--	--	--
Sweden	--	--	43.1 (39.4-46.8)	--	--	--	--	--	--
United Kingdom	--	2.5 (1.3-3.7)	43.9 (31.6-56.2)	--	--	--	--	27.4 (24.7-30.1)	28.0 (25.3-30.7)
Scotland	--	2.5 (1.3-3.7)	46.7 (42.6-50.9)	--	--	--	--	27.4 (24.7-30.1)	28.0 (25.3-30.7)
Overall	**17.9 (16.2-19.6)**	**23.9 (21.2-26.5)**	**32.8 (28.6-37.0)**	**13.3 (10.3-16.4)**	**49.1 (40.1-58.1)**	**40.3 (32.5-48.1)**	**20.1 (12.2-28.0)**	**30.5 (21.2-39.8)**	**36.2 (29.6-42.9)**

Note: Please see **Appendix 6 pp.90-94** for details of data sources in this table, and for a complete list of the countries in each region, including countries where no estimates were identified but where injecting drug use has been documented.

Figure 1: Regional (top) and country (bottom) pooled estimates of the percentage of people who inject drugs (PWID) engaging in recent (past month) receptive syringe sharing



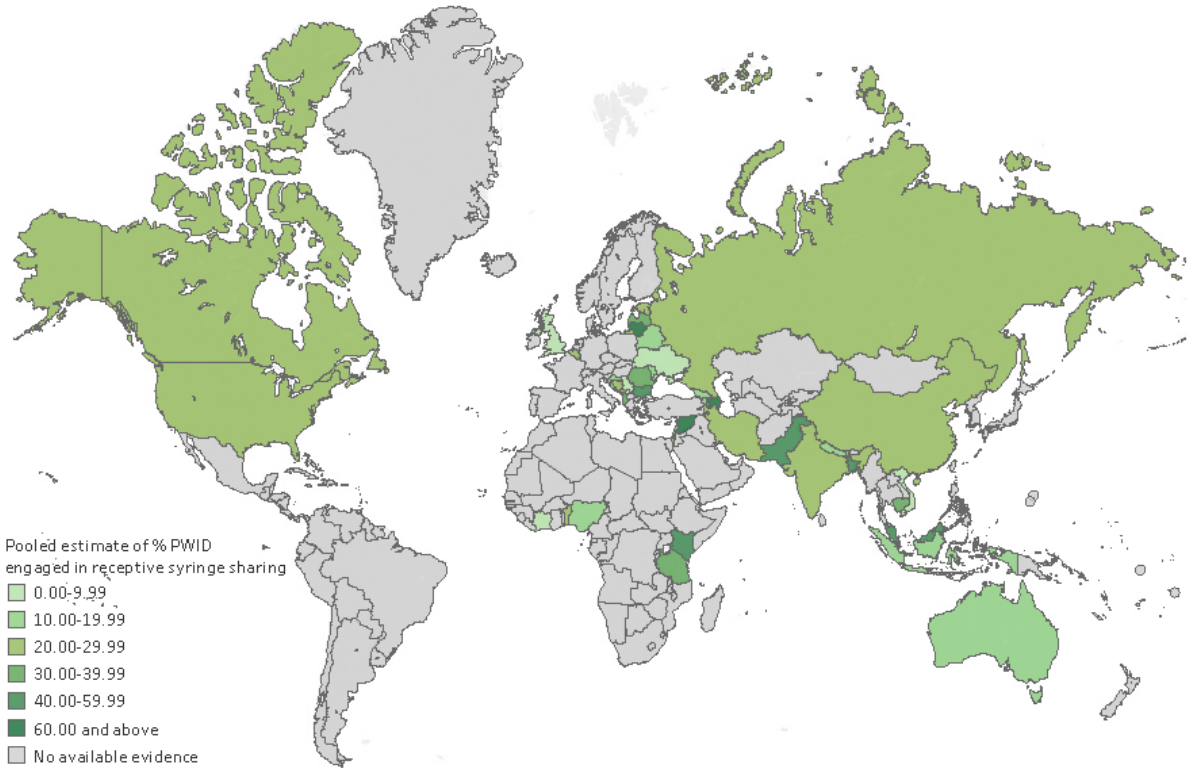
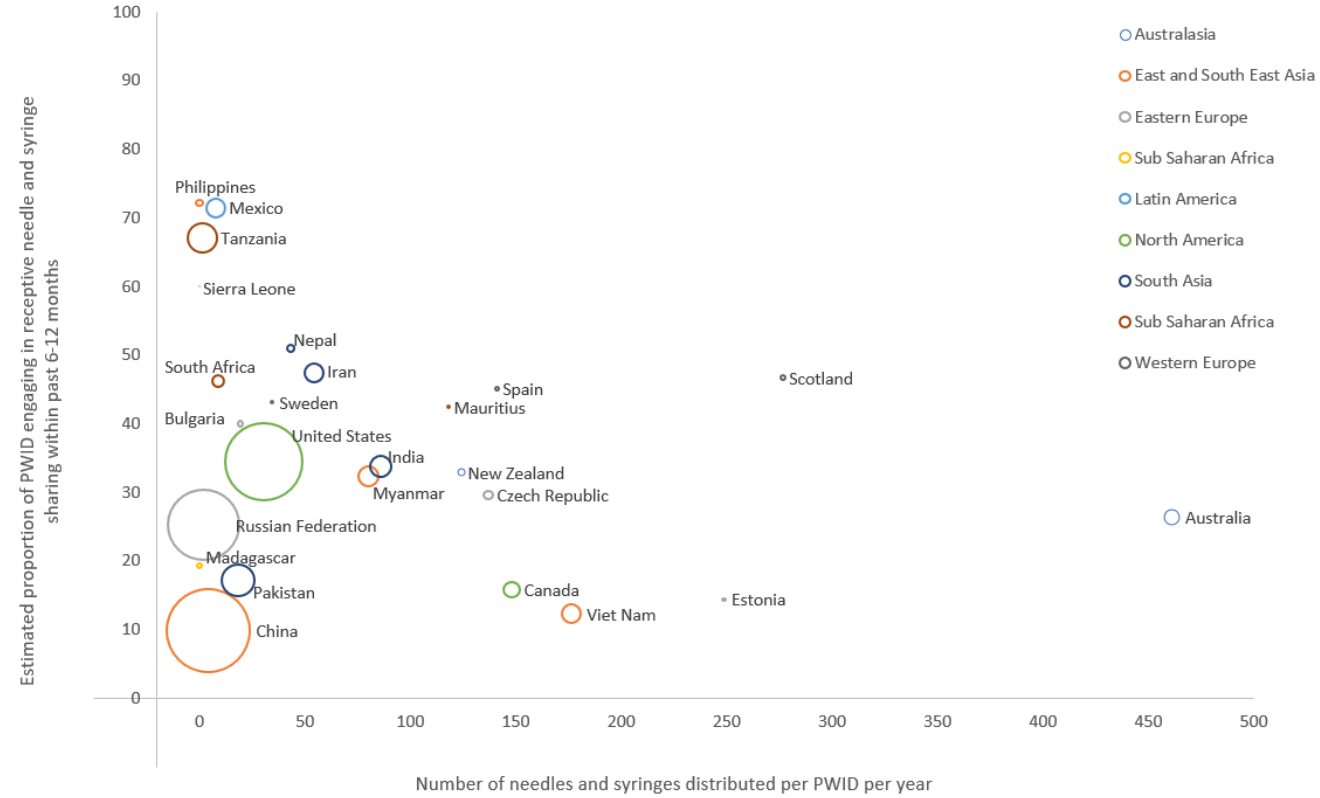


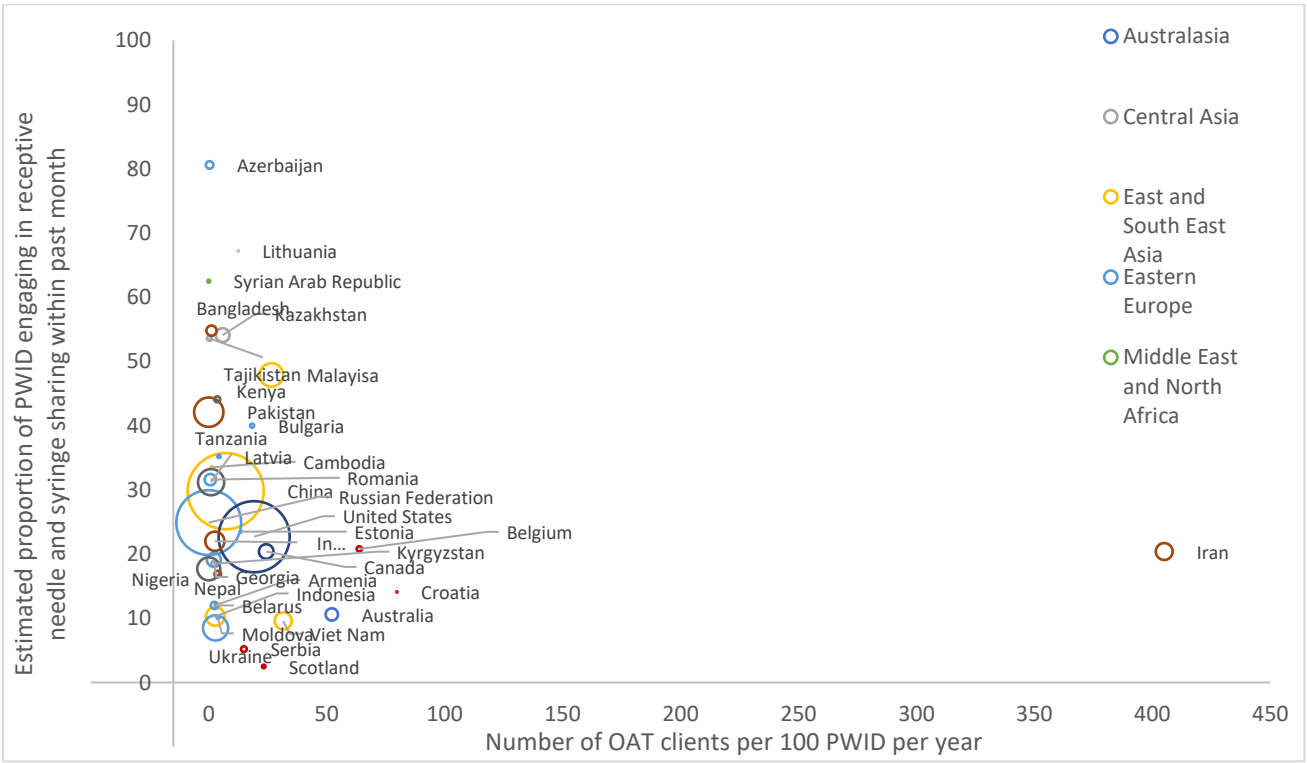
Table 4: Association of study- and country-level variables with past month receptive needle/syringe sharing among people who inject drugs (PWID)

Outcome: receptive needle/syringe sharing in the past month	N studies	Unadjusted model			
		Coefficient	SE	95% CIs	p
Study-level variables					
Percentage of sample that are female	**178**	**-0.20**	**0.08**	**(-0.37, -0.03)**	**0.019**
Median/mean age of sample (years)	183	0.00	0.00	(-0.01, 0.00)	0.242
Mean injecting duration of the sample (years)	**130**	**-0.01**	**0.00**	**(-0.02, 0.00)**	**0.005**
Year of data collection	**201**	**-0.02**	**0.00**	**(-0.03, -0.01)**	**<0.001**
Percentage of sample injecting daily or more	**124**	**0.27**	**0.06**	**(0.16, 0.39)**	**<0.001**
Percentage of sample recently homeless/with unstable housing	73	0.18	0.14	(-0.09, 0.45)	0.192
Percentage of sample whose main drug injected was opioids	48	0.15	0.11	(0.07, 0.36)	0.183
Country-level variables					
Region					
Eastern Europe (ref.)	58				
Western Europe	**21**	**-0.19**	**0.05**	**(-0.29, -0.09)**	**<0.001**
Australasia	**24**	**-0.16**	**0.05**	**(-0.26, -0.07)**	**0.001**
The Americas	17	-0.06	0.05	(-0.17, 0.05)	0.284
East and South east Asia	**19**	**-0.13**	**0.05**	**(-0.24, -0.03)**	**0.013**
South Asia	44	0.08	0.04	(0.00, 0.16)	0.053
Middle East and Africa	18	-0.05	0.05	(-0.16, 0.06)	0.361
Human Development Index 2016	**201**	**-0.46**	**0.11**	**(-0.67, -0.25)**	**<0.001**
Gender Inequality Index 2014	**191**	**0.40**	**0.09**	**(0.22, 0.59)**	**<0.001**
Income inequality (Gini coefficient)	199	-0.41	0.31	(-1.02, 0.21)	0.191
NSP coverage (number of needles/syringes per PWID per year)	**184**	**-0.45E-3**	**0.10**	**(-0.64E-3, -0.25E-3)**	**<0.001**
OAT coverage (number of people in OAT per 100 PWID)	190	-0.38E-3	0.22	(-0.82E-3, 0.07E-3)	0.093

Note. Values that are bolded are considered statistically significant (p<.050). SE: standard error; CIs: confidence intervals

Figure 2: Estimated percentage of people who inject drugs (PWID) engaging in receptive needle/syringe sharing in the previous 6-12 months, compared to the estimated number of needles-syringes distributed per PWID per year (top) and number of OAT clients per 100 PWID (bottom)





Note the estimates of needles-syringes distributed per PWID per year and number of OAT clients per 100 PWID per year were taken from earlier reviews[5]; size of the bubbles indicate the estimated number of PWID within the country taken from an earlier review[1].